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[Amendment of the claims under Article 19(1) (Rule 46)]

RE: International Application No. PCT/JP2005/004735
Applicant: TOYOTA JIDOSHA KABUSHIKI KAISHA et al.
Agent: MATSUDA, Hiroshi
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Dear Sirs:

The applicant, who has received the International Search Report relating to the above identified International Application transmitted on 24.06.2005, hereby submits the attached amendment under Article 19(1).

Claims 1, 2, and 5 to 8 are replaced by amended claims bearing the same numbers; claims 3 and 4 are canceled; claims 9-11 are unchanged; new claims 12 and 13 are added.

Also attached is a brief statement explaining the amendment and any impact the amendment might have on the description and drawings.

Very truly yours,

Hiroshi Matsuda
MATSUDA Hiroshi

Attachments:

- (1) Amendment under PCT Article 19(1) 5 sheets
- (2) Brief Statement under PCT Article 19(1) 2 sheets

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Statement under Article 19(1)

Claims 1, 2, and 8 have been amended to add the subject matters of claims 3 and 4 and limitations of "repeatedly changing the air-fuel ratio of the exhaust between a rich state and a lean state" and "when the estimated accumulation amount is less than or equal to a burn-up start determination value." The recitation of "intermittently decreasing the air-fuel ratio" in claims 1, 2, and 8 has been amended to "repeatedly changing the air-fuel ratio of the exhaust between a rich state and a lean state" for clarification. Support for amendments to claims 1, 2, and 8 can be found on, for example, page 1, lines 21-24, page 11, lines 15-19, page 32, lines 15-22, and descriptions relating to steps S128 and S138 shown in Fig. 3. As to claims 5 to 7, dependencies have been amended. Support for newly added claims 12 and 13 can be found on paragraph bridging pages 24 and 25 and paragraphs bridging pages 26 and 27. Therefore no new matter has been introduced by the amendment under Article 19.

According to claims 1, 2, and 8 of the present invention, a large amount of fuel is not released into the exhaust within a short period of time when the catalyst is in an inactivation state. Thus, inadvertent increase in the accumulation amount of particulate materials is prevented.

No prior art publications cited in the International Search Report disclose or suggest the subject matters of the present invention including (i) repeatedly changing the air-fuel ratio of the exhaust between a rich state and a lean state when a relatively small amount of particulate matter is accumulated in the exhaust purification apparatus, (ii) continuously lowering the air-fuel ratio of the exhaust when a relatively large amount of particulate matter is accumulated in the exhaust purification apparatus, and (iii) prohibiting burn-up heating when the

temperature detected by the temperature detector decreases to a catalyst inactivation level. Thus, the present invention is not anticipated by and is not obvious over the prior art publications cited in the International Search Report.

CLAIMS

1. (Amended) A regeneration controller for eliminating particulate matter accumulated in an exhaust purification apparatus in an exhaust system of an internal combustion engine, in which exhaust having an air-fuel ratio passes through the exhaust system during engine operation, wherein the exhaust apparatus includes catalyst, the regeneration controller comprising:
- 5 a heating section for heating the exhaust purification apparatus and eliminating the particulate matter accumulated in the exhaust purification apparatus when an estimated accumulation amount is greater than a reference accumulation amount, the heating section obtaining the estimated
 - 10 accumulation amount by estimating the amount of particulate matter accumulated in the exhaust purification apparatus;
 - 15 a temperature detector for detecting temperature of the exhaust purification apparatus;
 - 20 a control section for repeatedly changing the air-fuel ratio of the exhaust between a rich state and a lean state to perform burn-up heating of the exhaust purification apparatus for burning the particulate matter accumulated in the exhaust purification apparatus and for continuously lowering the air-fuel ratio of the exhaust to perform normal
 - 25 heating of the exhaust purification apparatus, wherein the control section performs burn-up heating when the estimated accumulation amount is less than or equal to a burn-up start determination value and performs normal heating when the estimated accumulation amount is greater than the reference
 - 30 accumulation amount and the burn-up start determination value; and
 - a prohibition section for prohibiting burn-up heating when the temperature detected by the temperature detector decreases to a catalyst inactivation level.

2. (Amended) A regeneration controller for eliminating particulate matter accumulated in an exhaust purification apparatus in an exhaust system of an internal combustion engine, in which exhaust having an air-fuel ratio passes
5 through the exhaust system during engine operation, wherein the exhaust apparatus includes catalyst, the regeneration controller comprising:

10 a heating section for heating the exhaust purification apparatus and eliminating the particulate matter accumulated in the exhaust purification apparatus when an estimated accumulation amount is greater than a reference accumulation amount, the heating section obtaining the estimated accumulation amount by estimating the amount of particulate matter accumulated in the exhaust purification apparatus;

15 a temperature detector for detecting temperature of the exhaust purification apparatus;

a control section for repeatedly changing the air-fuel ratio of the exhaust between a rich state and a lean state to perform burn-up heating of the exhaust purification
20 apparatus for burning the particulate matter accumulated in the exhaust purification apparatus and for continuously lowering the air-fuel ratio of the exhaust to perform normal heating of the exhaust purification apparatus, wherein the control section performs burn-up heating when the estimated
25 accumulation amount is less than or equal to a burn-up start determination value and performs normal heating when the estimated accumulation amount is greater than the reference accumulation amount and the burn-up start determination value; and

30 a prohibition section for prohibiting burn-up heating when the period during which the temperature detected by the temperature detector is lower than a catalyst inactivation level is longer than a prohibition determination reference period.

3. (Canceled)

4. (Canceled)

5. (Amended) The regeneration controller according to claim 1 or 2, wherein the heating section performs normal heating when the prohibition section prohibits burn-up heating.

6. (Amended) The regeneration controller according to any one of claims 1, 2, and 5, wherein:

the exhaust purification apparatus includes a first exhaust purification mechanism arranged in the exhaust system and a second exhaust purification apparatus arranged downstream from the first exhaust purification apparatus; and

the temperature detector detects as the temperature of the exhaust purification apparatus at least one of the exhaust temperature between the first and second exhaust purification mechanisms and the exhaust temperature at a downstream side of the second exhaust purification mechanism.

7. (Amended) The regeneration controller according to any one of claims 1, 2, and 5, wherein the temperature detector detects as the temperature of the exhaust purification apparatus at least one of the temperature at an intermediate portion of the exhaust purification apparatus and the exhaust temperature at a downstream side of the exhaust purification apparatus.

8. (Amended) A method for eliminating particulate matter accumulated in an exhaust purification apparatus in an exhaust system of an internal combustion engine, in which

exhaust having an air-fuel ratio passes through the exhaust system during engine operation, the method comprising:

- 5 estimating the amount of particulate matter accumulated in the exhaust purification apparatus to obtain an estimated accumulation amount;
- 10 performing burn-up heating of the exhaust purification apparatus by repeatedly changing the air-fuel ratio of the exhaust between a rich state and a lean state to burn the particulate matter accumulated in the exhaust purification apparatus, when the estimated accumulation amount is less than or equal to a burn-up start determination value;
- 15 performing normal heating of the exhaust purification apparatus by continuously lowering the air-fuel ratio of the exhaust, when the estimated accumulation amount is greater than the reference accumulation amount and the burn-up start determination value;
- 20 detecting temperature of the exhaust purification apparatus; and
 prohibiting burn-up heating when the detected temperature decreases to a catalyst inactivation level.

25 9. The method according to claim 8, wherein said prohibiting burn-up heating includes prohibiting burn-up heating when the detected temperature is less than or equal to a predetermined temperature.

30 10. The method according to claim 8, wherein said prohibiting burn-up heating includes prohibiting burn-up heating based on a period during which the detected temperature is less than or equal to a predetermined temperature.

11. The method according to any one of claims 8 to 10, wherein said detecting temperature of the exhaust

purification apparatus includes detecting temperature of the exhaust flowing through the exhaust purification apparatus.

5 12. (New) The regeneration controller according to claim 1 or 2, wherein when the temperature detected by the temperature detector decreases to a catalyst inactivation level while the normal heating is being performed, the prohibition section does not prohibit heating of the exhaust purification apparatus.

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13. (New) The method according to claim 8, wherein when the detected temperature decreases to a catalyst inactivation level while the normal heating is being performed, prohibition of heating the exhaust purification apparatus is not performed.

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